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ABSTRACT

Information about the neuropsychological consequences of alcoholism has been mostly limited to the cognitive functioning of recently detoxified alcoholic men. To expand this research, the long-term recovery of cognitive abilities in alcoholic women was examined in two studies. In the first study, neuropsychological performances were compared for three matched groups of recently detoxified alcoholics (sober for about one month), recovering alcoholics (sober for about four years), and nonalcoholic controls. Recently detoxified alcoholics demonstrated deficits in perceptuospatial and problem-solving skills, but not in general verbal intelligence. Performance of recovering alcoholics was typically intermediate to the other two groups. In the second study, detoxified alcoholics and controls were tested once and then retested a year later. Performances of the abstinent/infrequent alcoholics improved more than those of the alcoholics who had resumed drinking and more than the retested controls. However, at retest, the alcoholics remained impaired on a number of measures. Results indicate that a slow improvement in the cognitive functioning of recovering alcoholic women occurs, with some perceptuomotor deficits remaining even after an average of four years of sobriety, but with more complex problem-solving skills recovering partially within a year. (Author/KMF)

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Changes in Cognitive Functioning in Recovering Alcoholic Women[1]

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Cognitive functioning was examined in recovering female alcholics over time (one month, one year, and four years). Performance improved relatively slowly, with some perceptuomotor deficits remaining after an average of four years of sobriety. More complex problem-solving skills appeared to recover within the first year of abstinence.

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Changes in Cognitive Functioning in Recovering Alcoholic Women[1]

Marjorie S. Fabian and Oscar A. Parsons

Although a great deal is known about the neuropsychological consequences of alcoholism, this knowledge is primarily limited to the cognitive functioning of recently detoxified alcoholic men (e.g., see Parsons & Farr, 1981). Only recently have a few studies (Fabian & Parsons, 1981; Silberstein & Parsons, 1980) examined the effects of alcoholism on the cognitive performance of women, who were also tested shortly past the detoxification phase. These studies found that the pattern of deficits in the short-term abstinent alcoholic women was almost identical to that found in men: impaired problem-solving, perceptuomotor and perceptuospatial skills, but intact general verbal intelligence. The next step in this line of research, and of critical importance, are the questions addressed in this paper: Do the cognitive deficits found in recently detoxified alcoholics lessen over time? Can abstinent alcoholics hope to perform at "normal", nonalcoholic levels? Is there a differential rate of recovery for different abilities? What is the time course for recovery?

The relatively few studies on recovery of cognitive functioning have focused primarily on male alcoholics, and many also have some serious methodological problems. Several studies reported improvement in cognitive performance within the first few weeks of abstinence (Allen, et al., 1971; Goldman & Rosenbaum, 1976; Page & Linden, 1974; Smith & Layden, 1972; Weingarten, et al., 1971), but other researchers found that alcoholics did not improve more than controls who were retested (Eckardt, et al., 1979). Long-term changes in cog-

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nitive functioning have received even less attention: a few studies found improved performance on some cognitive measures in a group of alcoholics retested six to twelve months, as compared to their initial testing, when they had been sober for a short time (Eckardt, et al., 1980; Long & McLachlan, 1974; McLachlan & Levinson, 1974; Ornstein, 1977). However, improvement due to the retesting procedure itself could not be assessed since control groups were only tested once.

This study employed two different experimental designs to investigate changes in cognitive functioning over time in recovering alcoholic women. Study 1 compared performances of independent groups matched for age and education: 70 nonalcoholic controls; 40 recent, detoxified alcoholics, sober (minimum 10 days); approximately a month, and 40 recovering alcoholics, sober an average of four (minimum one year). years. Study 2 was a test-retest design. Twenty-six alcoholics were tested after a month of sobriety, and retested a year later; and twenty-four matched controls were tested twice, also with a year between sessions.

Method

Subjects. All subjects were volunteers from the Oklahoma City area, gave their informed consent, and were paid for their participation. They were screened for depression, head trauma, drug abuse and current psychoactive medication. Alcoholics were defined as such on the basis of alcohol-related problems in their lives and residency in an alcoholism treatment program. On the average, they had been drinking seven ounces of ethanol per day and had a six to seven year history of alcoholism. Nonalcoholic controls were recruited from the community through church and social groups, advertising and word-of-mouth. All subjects were of lower-middle to middle socioeconomic class; their

average age was 45 years, and their average amount of education was about 12.5 years. With the exception of the second test administration for the study 2 followup subjects, the protocol was the same for all subjects. Tests were typically administered in two sessions by trained female psychometricians. In the first session, subjects received a screening battery consisting of medical, personality, social background, and several drinking questionnaires; the Beck Depression Index (Beck, 1967); the Shipley-Hartford Institute of Living Scale (Shipley, 1948); and Raven's Advanced Progressive Matrices (Raven, 1965). The majority of the neuropsychological tests were administered in the second session. Selected from the Halstead-Reitan Battery, currently our most reliable behavioral measure of neuropsychological impairment (Reitan & Davison, 1974), were the Halstead Category Test, a measure of nonverbal abstracting ability; the Halstead Tactual Performance Test (TPT), an assessment of tactual spatial skill; and the Trail Making Test, a test of visual-motor speed and set flexibility. The Comprehension (judgement), Similarities (verbal abstracting), and Digit Span (short-term memory) subtests were given from the Verbal Scale of the Wechsler Adult Intelligence Scale (WAIS: Wechsler, 1955); and the Block Design, Digit Symbol and Picture Completion subtests (visual-motor and visual-spatial abilities) were administered from the Performance Scale. Subjects were also administered the Memory-for-Designs (Graham & Kendall, 1960), a constructional test of visual-spatial memory; the Bender-Gestalt (Bender, 1938), which measures visual-motor performance; and the Wisconsin Card Sorting Test (Grant & Berg, 1948), a measure of nonverbal abstracting and set flexibility.

The retest battery for the follow-up subjects was shortened so that it could be administered in a few hours; the Bender-Gestalt, WCST, Raven's Set II, and several questionnnaires were dropped.

Results

Study 1. Seventeen nonredundant measures were factor analyzed to determine the natural grouping of cognitive abilities, based on the underlying pattern of relationships among the measures. Four factors were extracted by the principal components method and related to a terminal solution by the varimax method. Factor 1 described problem-solving, perceptual-motor and perceptual-spatial skills; receiving heavy loadings from WAIS Block Design and Digit Symbol, Memory-for-Designs, Trail Making B, Raven's Set I, Shipley Abstract, Halstead Categories and TPT Time, and the Bender-Gestalt. Factor 2 clearly represented verbal abilities and was comprised of WAIS Similarities, Comprehension, and Picture Completion; and Shipley Vocabulary. Of relative unimportance, Factor 3 consisted of TPT Memory & Location, and Factor 4 was comprised of the WCST. Summary measures of performance on each factor were provided by factor scores, which were used in the following analyses. A multivariate analysis of variance of the factor scores from the four factors for the three groups was highly significant F (72,204) = 5.75, $p < .001$. Analyses of variance for each factor revealed significant differences only on Factor 1, which tapped problem-solving, perceptuomotor and perceptuospatial skills, F (2, 141) = 13.09, $p < .001$. Comparison of the Factor 1 means via Duncan's Multiple Range Test indicated that the one-month sober alcoholics performed significantly more poorly than did the four-year sober alcoholics and the controls; however, the four-year sober alcoholics were significantly poorer than the controls using a standard t-test. Figure 1 illustrates the performance pattern for the three groups on Factors 1 through 3.

INSERT FIGURE 1 ABOUT HERE

The left side of Table 1 presents the significant differences on the individual measures between the controls and the one-month sober alcoholics, and between the controls and the four-year sober alcoholics. Clearly, the one-month

INSERT TABLE 1 ABOUT HERE

sober alcoholics showed deficits on all Factor 1 related measures and on several composite indices as well. The four-year sober alcoholics, on the other hand, demonstrated impaired performance on only five of the seventeen measures on which the recently detoxified alcoholics had manifested deficits, plus one additional measure.

Finally, tests for differences between means for the three groups using Duncan's Multiple Range Test revealed that the four-year sober alcoholics performed at the control level on six measures (Block Design, MFD, Bender-BIP, TPT-Left Hand, Halstead Impairment Index, and Category Test); at the short-term sober alcoholic level on three measures (Trail Making A, WAIS Digit Symbol and Performance IQ); and performed at a level intermediate to, but not significantly different from both groups on eight measures.

Study 2. Of the 26 alcoholics who were retested a year after initial testing, 17 were abstinent or infrequent drinkers and nine were drinking again, although at lower levels than before treatment. The right side of Table 1 summarizes the significant differences between all 26 alcoholics and their controls, and between the 17 abstinent/infrequent alcoholics and their controls for the individual measures from the first test (sober about one month), and the retest one year later. Comparison of retest performance for all 26 alcoholics and 24 controls revealed alcoholic deficits on 12 of 14 possible Factor 1 related tests;

interestingly, they were no longer significantly impaired on the Category Test or WAIS Picture Completion.

Conclusions based on the performance of the 17 abstainer/infrequent alcoholics and their controls must be tentative because of the small sample sizes involved. At retest, the abstinent/infrequents demonstrated deficits on four of the five measures on which they had shown impairment at first testing when sober for a month. Figure 2 illustrates the change in performance in Factors 1-3 from first to second testing for the 17 abstinent/infrequent alcoholics and their controls. The alcoholics improved more than did the controls on the Factor 1 measures, although their retest performance was still significantly lower than that of the controls.

INSERT FIGURE 2 ABOUT HERE

Table 2 presents results of paired t-test analyses comparing first and second test performance for all alcoholics and controls, and for the 17 abstinent/infrequent alcoholics and their controls. Significant improvement was

INSERT TABLE 2 ABOUT HERE

shown on six measures by the total group of drinking and nondrinking alcoholics; however, significant improvement on four measures was demonstrated by the 24 controls. In contrast, the 17 abstinent/infrequent alcoholics improved on seven measures and their controls only improved significantly on two. Noteworthy is the lack of improvement by either group of alcoholics on Trail Making Test A or B, on which the controls improved; and the significant improvement on the Categories Test for the alcoholics but not for the controls.

Discussion

An independent groups design (Study 1) and a test-retest analysis (Study 2) were employed to assess changes in the cognitive functioning of alcoholic women over time. The one-month sober alcoholics in both studies demonstrated deficits on all Factor 1-related measures (abstracting, perceptual-motor and perceptual-spatial skills), but not on Factor 2 measures (general verbal intelligence); replicating findings with short-term sober male alcholics. The 26 alcoholics in Study 2 who were then retested a year later showed some improvement on some tests, but scores of the controls also improved; thus stressing the importance of including retested control groups in the analysis. When the nine alcoholics who had been drinking in the intervening year were removed from the group, it was found that scores of the one year abstinent/infrequent alcoholics had improved significantly more than had those of the controls, although their retest performance was still below par on many tests. An exception was the Category Test, a rather high-level abstracting test on which impairment was found on first testing, but not at retest; within a year performance had improved to nonalcoholic levels.

Performances of the long-term sober alcoholics averaging four years of sobriety was generally intermediate to that of the one-month sober alcoholics and the controls; and compared to their respective control groups, the four-year sober alcoholics had fewer deficits and performed at nonalcoholic levels on more tests than did the one-year retested alcoholics. Interestingly, the six measures on which the four-year sober alcoholics were performing at control levels included the Category Test and others which involved higher-level abstracting and problem-solving skills; whereas the measures on which they performed at one-month sober levels included Trail Making Test A and WAIS Digit Symbol, tests requiring perceptuomotor speed.

Thus, it appears that there may be a differential rate of recovery of cognitive abilities over time in female alcoholics. Maximum impairment was found with an average of a month of sobriety, with deficits on almost all problem-solving, abstracting, perceptual-spatial and perceptual-motor measures in the battery. With a year's abstinence, performance improved somewhat more than did performance of retested controls and drinking alcoholics, but many deficits remained. High-level abstracting skills not requiring perceptual-motor speed appeared to recover within this first year. With an average of four years of sobriety performance of recovering alcoholics was less impaired, although some perceptual-motor and perceptual-spatial deficits are evident. Performance on most measures was intermediate to that of one-month sober alcoholics and controls; again, the higher level abstracting skills appeared to recover fully.

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Table 1

Significant Differences Between Groups:

	STUDY 1		STUDY 2			
	40 Alcoholics vs. 70 Controls	40 Recovered Alcoholics vs. 70 Controls	26 Alcoholics vs. 24 Controls		17 Abstin. Alcoholics vs. 17 Controls	
			1st Test	Retest	1st Test	Retest
FACTOR 1+(Related Measures)						
(Trail Making Test A)	**	*	*	**		
Trail Making Test B	***		*	*		
Memory for Designs	***	*	**	*	*	
WAIS Block Design	**		***	***	***	**
WAIS Digit Symbol	***	**				
Raven's Adv. Matrices I	*		**	**		*
(Raven's Adv. Matrices II)	***	*	*	N/A	*	N/A
Shipley Abstract	**		**	*		
(Shipley C.Q.)	*		**	**		
Tactual Perf. Test Time	**		***	**	*	*
(Tactual Perf. Test Time LH)	**		***	**	*	*
Category Test	*		**			
Bender-Gestalt	*			N/A		N/A
(BIP)	**			N/A		N/A
FACTOR 2						
Shipley Verbal						
WAIS Similarities						
WAIS Comp.		*				
WAIS Pic. Complt.			*			
WAIS FSIQ	**		**	*		
WAIS PIQ	***	*	***	**		
Halstead Imp. Index	**		*	**		

*p < .05
**p < .01
***p < .001

Table 2

Study 2

Paired t tests - 1st Test vs. Retest

Significant Changes:

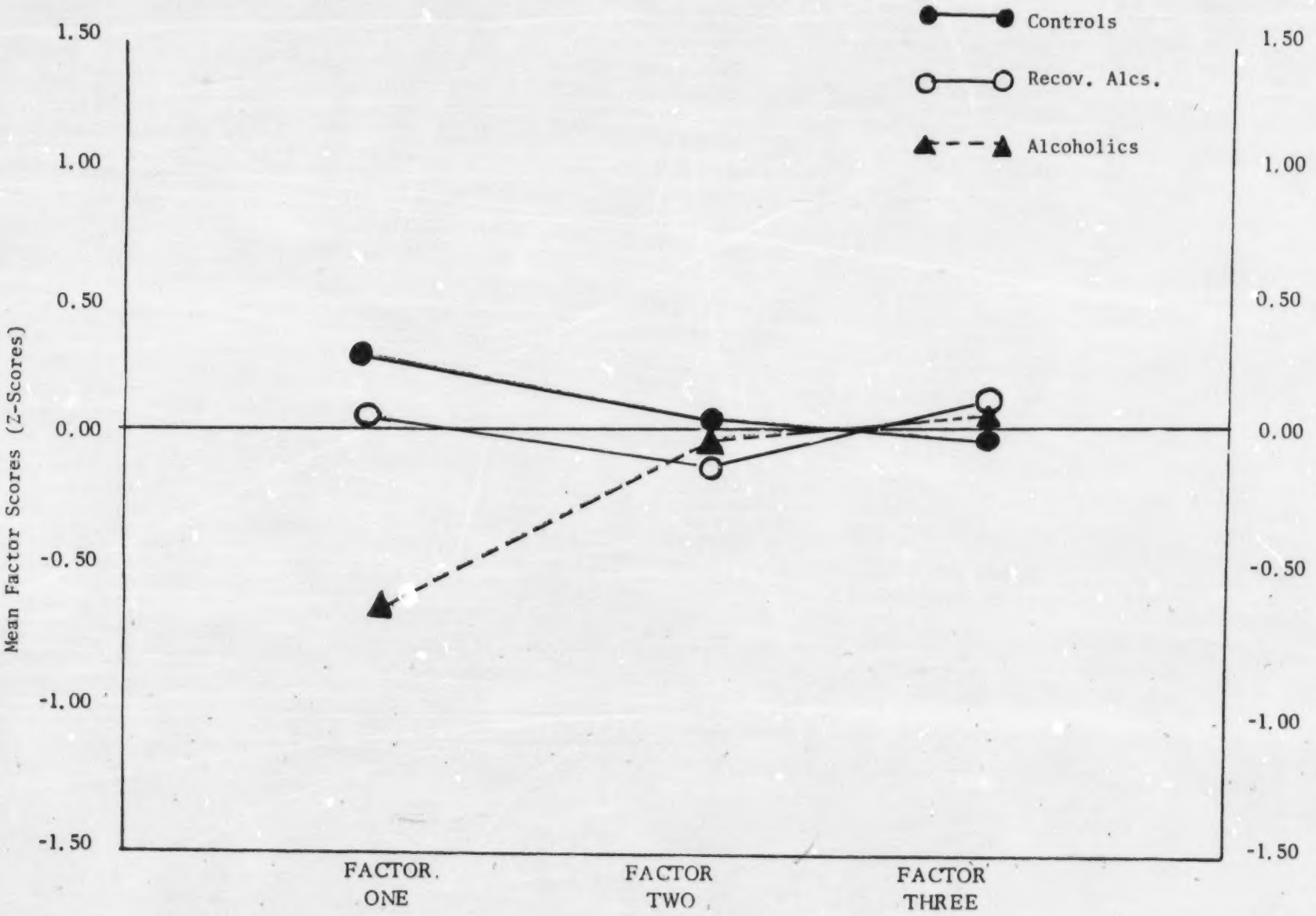
FACTOR 1 +(Related Measures)	N = 26 All Follow-up Alcoholics	N = 24 All Follow-Up Controls	N = 17 Abstin/Inf. Alcoholics	N = 17 Controls
(Trail Making Test A)		**		**
Trail Making Test B				
Memory for Designs				
WAIS Block Design	***		**	
- Digit Symbol				
Raven's I				
Shipley Abstract				
(- C.Q.)				
Tactual Perf. test time	*		*	
(- L. H.)				
Category Test	**		***	
FACTOR 2				
Shipley Verbal				
WAIS Simi.			*	
Comprehension				
Pic Complt.	**	*	**	
WAIS FSIQ	**	*	**	
PIQ	***	*	**	**

*p < .05

**p < .01

***p < .001

Figure 1. Mean Factor Scores for 70 Controls, 40 Recovering Alcoholics (Sober ~ 4 yrs.), and 40 Alcoholics (Sober ~ 1 mo.)



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SWPA 4/81

Figure 2. Mean Factor Scores for First Test and Retest Abstin/infreq. Alcoholics and Matched Controls (N=17 ea.)